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ABSTRACT

To assess the compatibility of miscue analysis and recall analysis as independent elements in a theory of reading comprehension, a study was performed that operationalized each theory and separated its components into measurable units to allow empirical testing. A cueing strategy model was estimated, but the discourse processing model was broken down into a content submodel and a structure submodel. Subjects, 94 fourth grade students, orally read a selection called "Space Pet" from the Reading Miscue Inventory, and then retold the story in his or her own words. Tape recordings were made of the reading and recall, then transcribed and coded for analysis. Factor analysis confirmed the existence of two distinct cueing strategy components--grapho-phonic and syntactic-semantics strategies--while regression analysis showed that the reader's ability to generate new knowledge from information rather than to recall verbatim was important to comprehension. In addition, results showed that children used three types of connectives to describe, associate, and integrate and that concatination, association, and synthesis were used by readers with new information. Finally, it was found that the syntactic-semantic and synthesizing strategies were most important in comprehension. (CRH)

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THE INTEGRATION OF PSYCHOLINGUISTIC AND DISCOURSE PROCESSING THEORIES OF READING COMPREHENSION

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The Integration of Psycholinguistic and Discourse Processing Theories of Reading Comprehension

Comprehension in reading involves the use of abstractive and constructive strategies. As a reader reads he abstracts or selects information from the text which he assimilates into his already existing repertoire of knowledge in order to be able to reconstruct or compose his own interpretation of the passage. Two methods have been developed for examining how readers perform these operations; namely, miscue analysis and recall analysis. The purpose of this research was to assess the compatibility of the two methods as independent elements in a theory of reading comprehension.

As a result of two decades of research into the qualitative analysis of oral reading errors a well developed theory of reading comprehension has been established whereby certain miscue phenomena are known to influence reading comprehension. According to psycholinguistic theory, the ability to understand print depends as much on what the reader brings to the reading situation as it does upon the graphics presented on the page. This notion emphasized the importance of a reader's already acquired syntactic and semantic abilities interacting with school-learned graphic and phonic abilities in order to produce comprehension during reading.

Recall analysis, on the other hand, surfaced somewhat later than miscue analysis and different researchers suggested a variety of categorical systems for analyzing the oral recall of reading passages. Kintsch and van Dijk (1978) have probably been the most explicit in specifiying the mental operations that underlie the processing of text

and the subsequent production of a recall of a text. They claim that three sets of operations are involved.

> First, the meaning elements of a text become organized into a coherent whole, a process that results in multiple processing of some elements and, hence, in differential retention. A second set of operations condenses the full meaning of the text into its gist. These processes are complemented by a third set of operations that generate new texts from the memorial consequences of the comprehension processes. (p.363)

In order to perform these operations, Kintsch and van Dijk have found that readers transform, reproduce and reconstruct text information during reading and during recall.

Tierney, Bridge and Cera (1978) supported these ideas when they found that grade three readers seemed to utilize abstractive processing; that is, they attempted: (1) to "glean what might be considered relevant units from the text; and (2) to summarize the ideas into a manageable form in accordance with what can be handled by the memory system" (p.552). At the same time, they claimed, the readers were constructing comprehension by "using information from the text in association with their background of knowledge..." (p.554).

It seems, then, that recall analysis theory is similar to miscue analysis theory in that both claim that readers selectively process text using information from the text and from their knowledge of the world as they construct an interpretation based upon the integration of the two sources of information. The question arises, then, whether the two explanatory frameworks --miscue analysis and recall analysis -- can be combined as an integrated theory of reading comprehension.

This task required, first of all, the formulation and specification of the miscue analysis or cue selection theory followed by the formulation

and specification of the recall analysis or discourse processing theory. The formulation and specification of the relationships between the two theories then had to be considered. In order to estimate the complementary nature of these two theories, an integrated model elucidating the theories was tested by estimating the magnitude and evaluating the significance of the parameters of the cue selection theory, while simultaneously taking into account the theory of discourse processing and vice-versa. In this way a model of the relationships between reading strategies and reading comprehension was formulated and estimated. The relationships in such a theory are shown in Figure 1.

Design of the Study

The two theories had to be operationalized such that they could be tested empirically which meant disaggregating the components of the theories into measurable variables. In order to accomplish this task a cueing strategy model was estimated; but the discourse processing model was broken down into two sub-models -- a content sub-model and a structure sub-model. Each is discussed in turn.

The Cueing Strategy Model

The cueing strategy model was measured using the well known Reading Miscue Inventory (1973) procedures as the basis for indentifying the graphic, phonic, syntactic and semantic variables that affect a reader's comprehension during reading. The conceptual model is presented in Figure 2.

The Discourse Processing Strategy Model

The discourse processing strategy model was based on the belief that by analyzing a text and comparing a subject's recall of the text

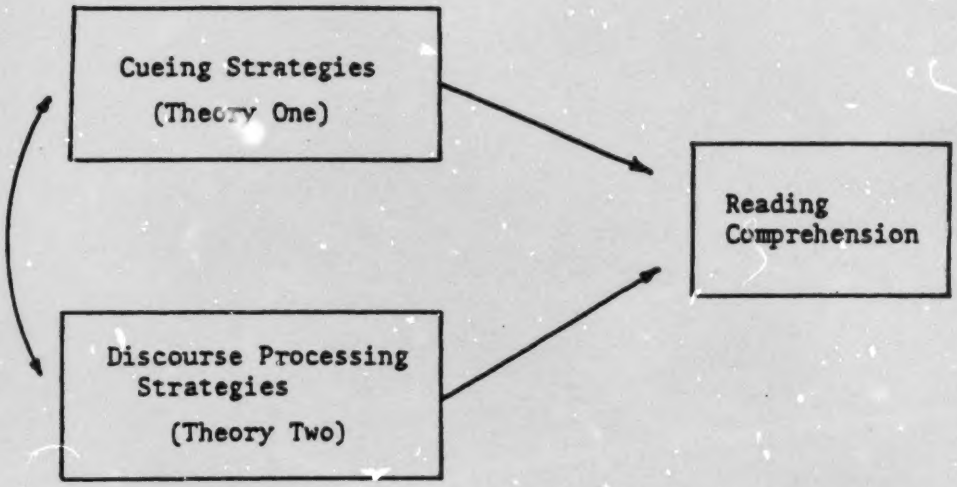

FIGURE 1. Conceptual Diagram of a Complementary Theory

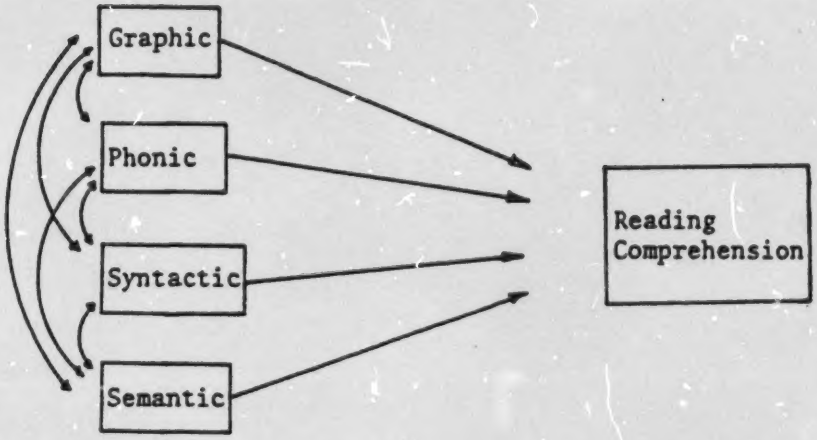

FIGURE 2. Conceptual Diagram of the Cueing Strategy Model

to the structure of the text itself, the nature of the reader's organizing procedures can be derived. That is, if readers' recalls are analyzed in order to determine what kind of information they have selected from the text, as well as how they have arranged and organized this information, it may give added insight into the processes involved in reading over and above the information provided by considering the components of cueing strategies. Recall analysis involves examining the "what" and the "how" of the abstractive and constructive processing of print in order that added insight may be gained into how the reader utilizes cueing strategies for comprehending print. The discourse processing strategy model, then, was disaggregated into two sub-models, the content or the "what" of the recall and the structure or the "how" of the recall. Discourse processing was also conceived as being responsive to the child's cueing strategies.

The Content Sub-Model

The recall categories used to assess what students recalled were similar to those developed by Drum and Lantaff (1977) which were, in turn, a modification of those developed by Kintsch (1974). After the student's recall was divided into clausal units and compared to the original passage that the child read (which was also divided into clausal units) each unit was assigned to one of four categories.

A conceptual diagram of the relationship between the content of recall and reading comprehension is shown in Figure 3. By analysing the units of information given in a reader's recall the researcher can estimate at least two processes. First, one can assess how much the reader is relying on trying to memorize exactly what is in the text; and second, how much he is attempting to incorporate the new information

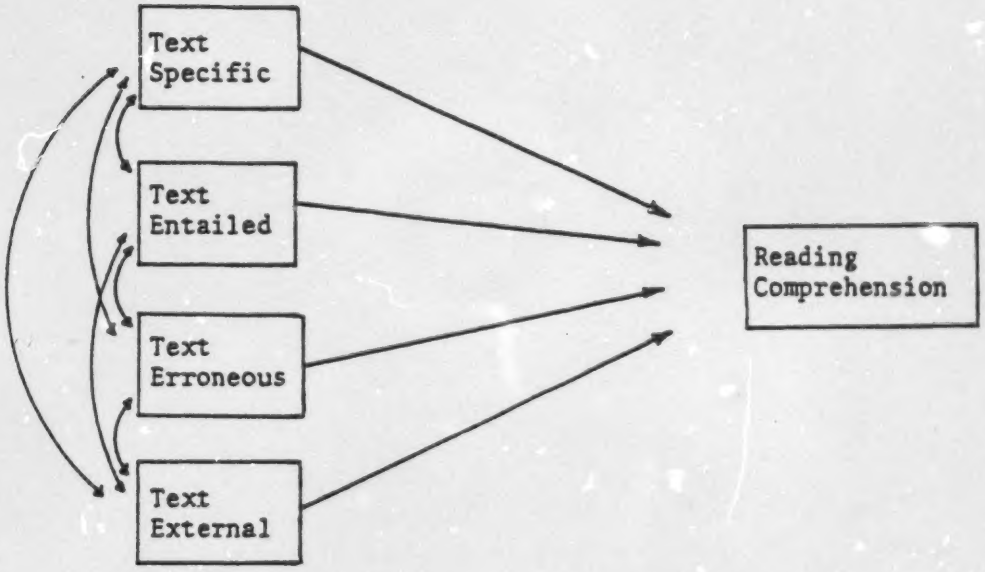

FIGURE 3. Conceptual Diagram of the Content Sub-Model

into his old, or already existing framework and, as a result, reproduce a recall that has a high degree of inferred, summarized or reconstructed information. The analysis of erroneous and external information also adds insight into the processing activities, especially if the reader has not miscued unacceptably during the reading. Perhaps the source of such inaccuracy is caused by readers misinterpreting text because they have inadequate or inappropriate background for the passage being read.

The Structure Sub-Model

In order to assess the degree to which the readers were inter-relating information during reading and consequently during their recall of the passage, Fagan's (1978) referential and logical connective analyses procedures were used. Analyzing referential connectives enables the researcher to evaluate the links or ties between and within each of the clausal boundaries presented in the recall. Specifically they are words that refer to another noun or pronoun or to an idea already mentioned. Examples would be pronouns, repetitions of lexical items, synonyms and even repetitions of nouns.

Logical connectives, for the most part, are conjunctions and convey the logical relationships that occur between and within clausal information units. Although there are eleven different types of logical connectives they can more easily be thought of as falling into three groups: (1) descriptiveconnectives which depict relationships between equivalent units and the manner or mode of the relationship; (2) explanatory connectives which express relationships of cause and effect, reasons for events, agreements in favour or against an event, contrastive events

and conditions or limitations of events; and (3) perceptual connectives which emphasize the time and/or spatial dimension of events.

By examining the logical connectives a reader uses, an attempt can be made to discover how the reader relates bits of incoming information together into a meaningful whole. A diagrammatic representation of the effects of the sturcture of recall upon reading comprehension is presented in Figure 4.

An Integrated Model of Reading Comprehension

When the two sub-models are integrated into a more comprehensive model, the relationships can be estimated in order to find out whether or not the two reading theories are complementary in nature. A diagrammatic representation of the integrated model is presented in Figure 5.

The Sample

Ninety-four grade four students constituted the case base for the study. Each child orally read a selection called "Space Pet" from the Goodman and Burke (1973) Reading Miscue Inventory (RMI) and then retold the story in his own words. The tape recording of the reading and the recall was then transcribed and coded prior to analysis.

The Dependent Variable

The reading comprehension measure was a grade equivalent score from the Canadian Tests of Basic Skills (King and Hieronymus, 1973). The reading test selections varied in length from a few sentences to a full page and each passage was followed by multiple choice questions. Pupils were required to answer 68 items in 55 minutes. King and Hieronymus (1975) report a split-half reliability of 0.92 for the

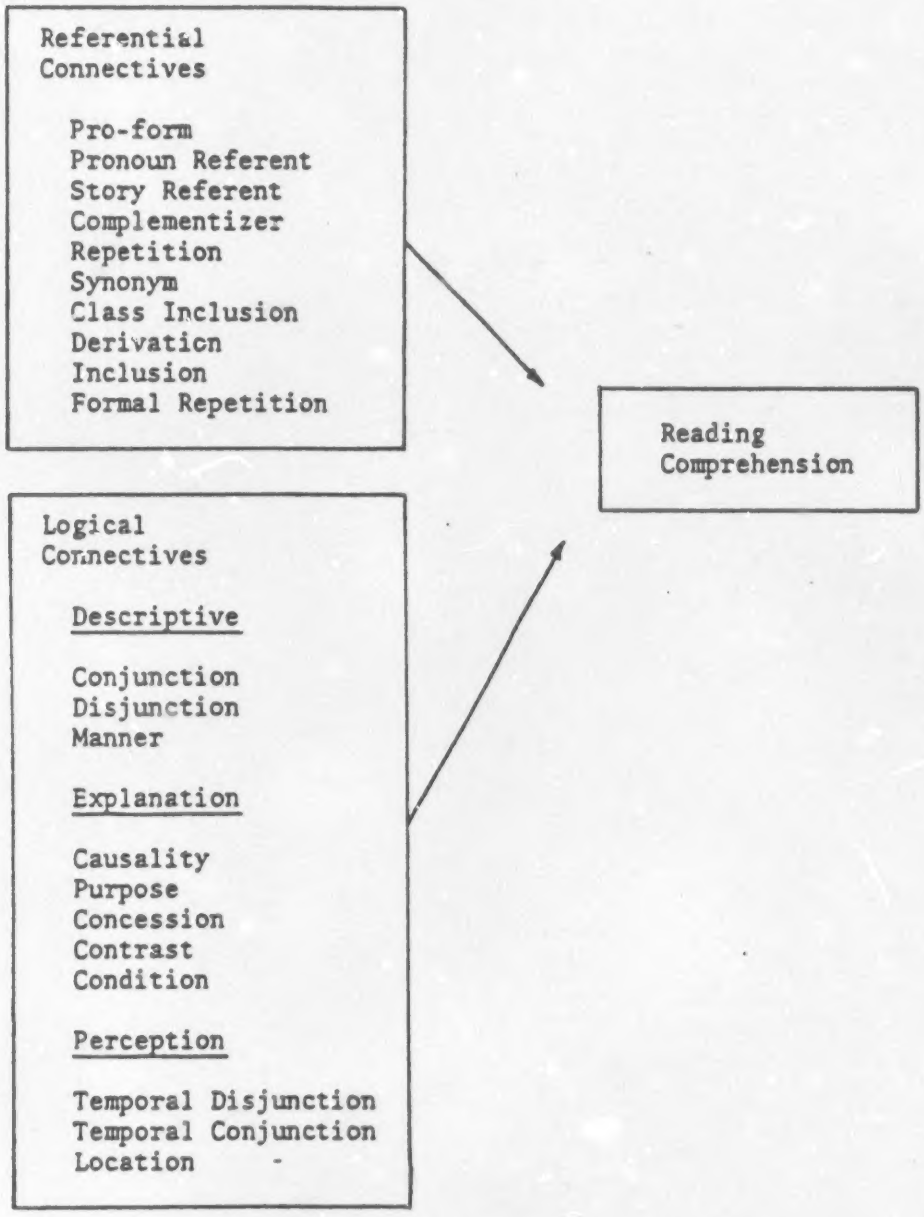

FIGURE 4. Conceptual Diagram of the Structure Sub-Model

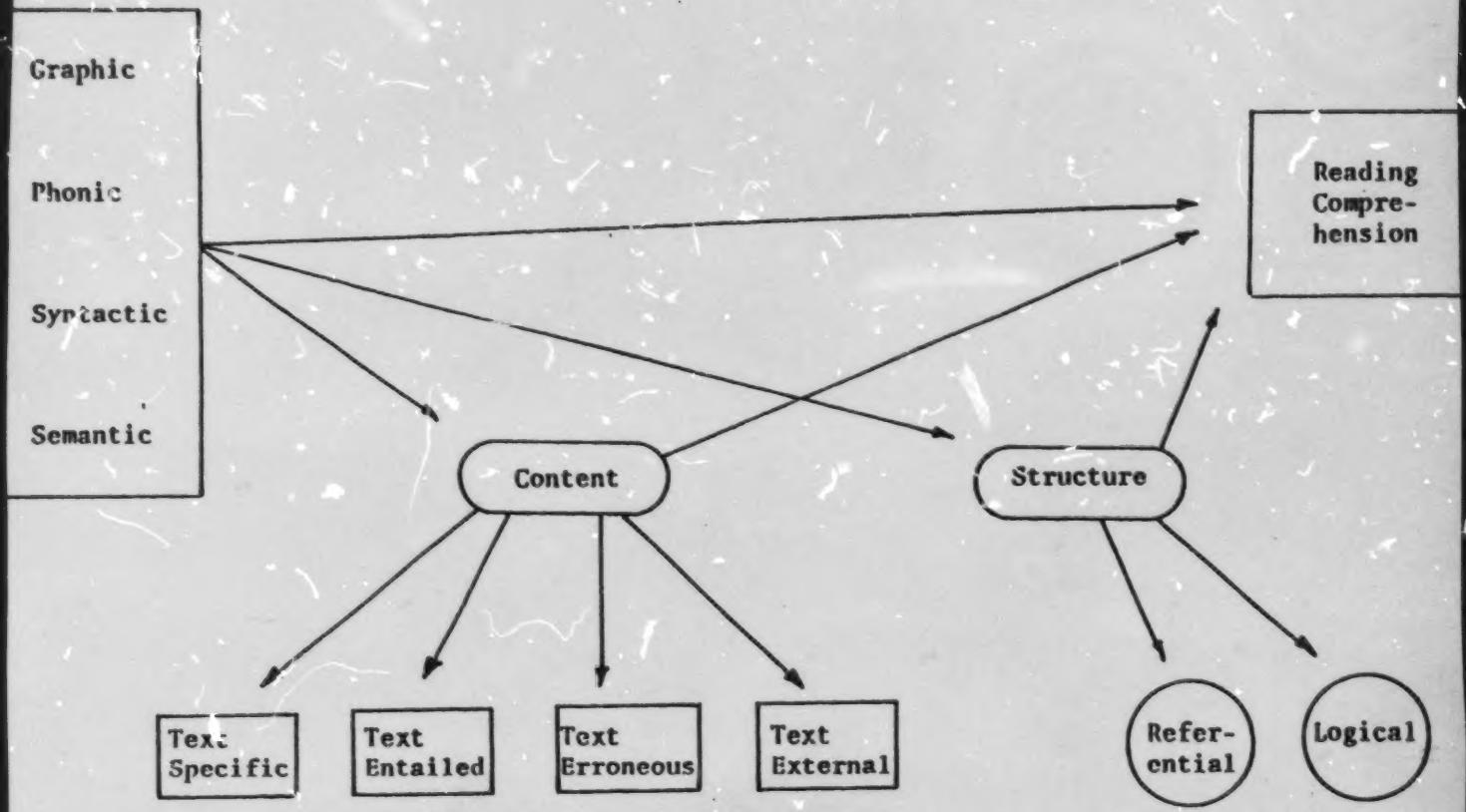

FIGURE 5. Conceptual Diagram of an Integrated Model of Reading Comprehension

Reading Comprehension subtest of the Canadian Basic Skills battery.

The Results

There were five major findings.

1. Factor analysis confirmed that there were two distinct cueing strategy components: grapho-phonic and syntactic-semantic strategies respectively. A regression analysis was then conducted to find out what effect each of these strategies had on reading comprehension. The standardized beta coefficient between reading comprehension and the use of the syntactic-semantic cueing strategy was substantial and highly significant even when taking into account the effect of the use of the grapho-phonic strategy. This indicated that, for this sample at least, what really made the difference between readers in their ability to comprehend was their facility at using what they knew about the flow of language together with their background of experiences in order to assist them in interpreting print. Their facility with letter-sound relationships had virtually no effect on their comprehesion acores. Perhaps this was due to the fact that by grade four the use of letter-sound relationships had been so well established that few children in this sample had problems using such relationships whenever necessary to assist them in decoding words. The results of the analysis are presented in Figure 6 and in Table 1.

2. When a regression analysis was conducted to estimate how much each of the content variables affected comprehension ability, it was found that the verbatim recall of information was not an important factor. Rather, what was important was the reader's ability to use such

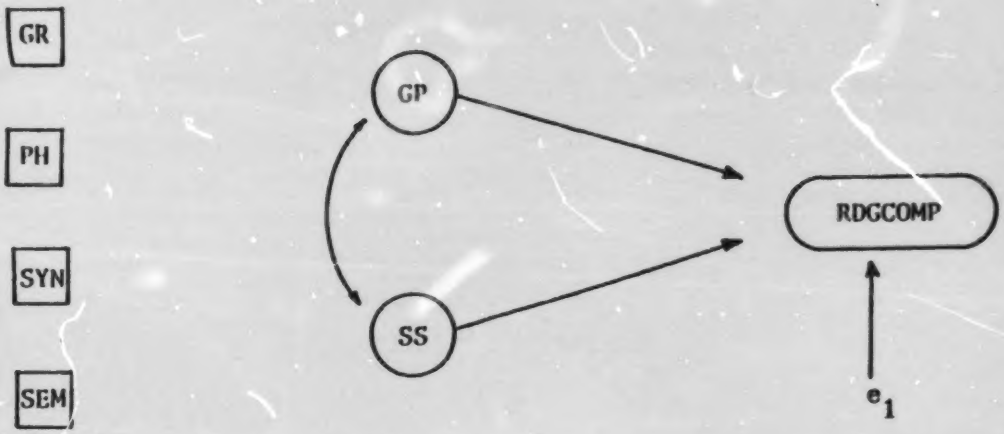

FIGURE 6. Specified Relationships in the Cueing Strategy Model

TABLE 1

Cueing Strategy Estimates: Structural Coefficients, R-Square, and F-ratio[a]

	Dependent Variable: RDG COMP				
Independent Variables	Simple Correlation	Regression Coefficients	Standardized Reg. Coeffs.	F-ratio	p
GP	-.136	-.9135	-.098	1.217	ns
SS	.596	5.7899	.539	44.063	.000
Constant	45.5273				
R-square	.3458				
Residual	.809				

a. The underlined simple correlation coefficient is not significantly different from zero at the .05 level of significance. Key to the variable mnemonics: GP = Graphophonic cueing strategy; SS = Syntactic-Semantic cueing strategy; RDGCOMP = reading comprehension.

information to generate a more complex kind of information containing new knowledge which resulted from the interaction of the selected information and the reader's own store of knowledge. The importance, then, was not in the abstracted information itself but in what the reader did with the information as he read; that is, did he integrate, synthesize and summarize the incoming pieces of information or did he lack the relevant background; hence, convert it into erroneous ideas? If he simply recalled the abstracted information verbatim, it was not a predictor of reading comprehension in the presence of the other variables.

3. As a result of using factor analytic techniques, it was found that three types of connectives were used. These children used connectors to describe and string together much of the textual information. Another type of connective was used to indicate a definite relationship or association between two pieces of information. A third set of connectives was used to integrate ideas. Of the three strategies, the two that were important for assisting the students in comprehending the story were integrating the ideas through the use of some connectives and to a lesser degree associating ideas through the use of other connectives.

4. Once the content and structure sub-models (or the what and the how of discourse processing) were merged through factor analytic techniques, three clearly delineated factors emerged. The readers in this study concatinated or strung to gether information from the text in a correct manner or in an incorrect manner. Secondly, they associated two or more ideas from the story. Thirdly, they synthesized information from the text by taking the details of the content of the story and summarizing, integrating and relating it to their background of knowledge in order

to more fully comprehend. The results of the analysis used to estimate the effects of the three discourse processing variables on reading comprehension are presented in Figure 7 and Table 2.

5. Finally, the cueing strategy composite variables and the discourse composite processing variables were integrated into a single model in order to see whether the two models were complementary and how they affected one another. As one might expect, the syntactic-semantic cueing strategy and the synthesizing strategy were the two abilities that were important for the best comprehension of the passage. The only other significant relationship was the effect of syntactic-semantic ability of synthesizing ability. These results are presented in Figure 8 and Table 3.

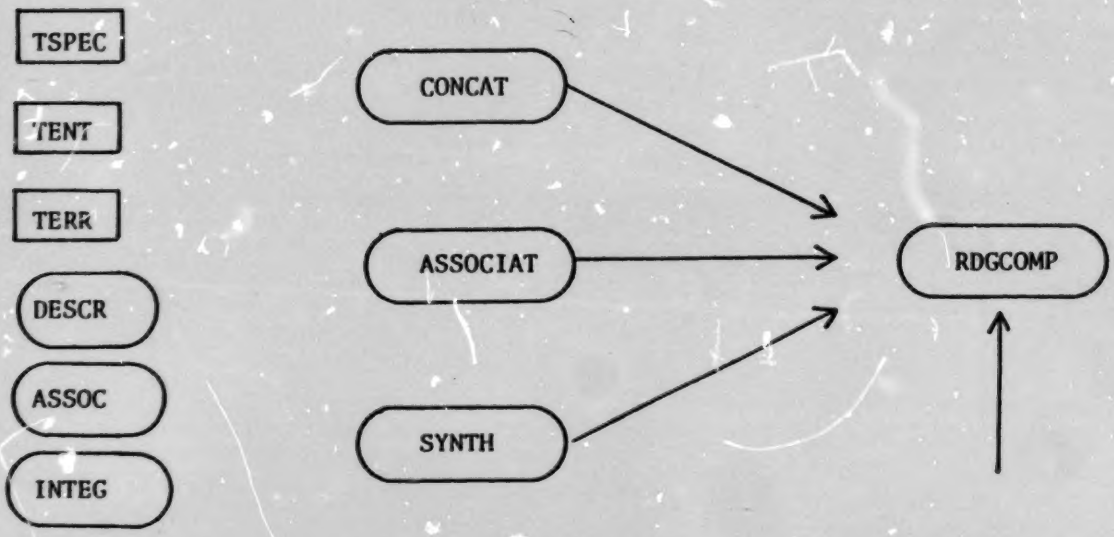

Figure 7. Relationships in the Discourse Processing Model of Reading

Table 2

Discourse Processing and Reading: Structural Coefficients, R-Square and F-ratios[a]

Independent Variables	Simple Correlation	Regression Coefficients	Dependent Variable - RDGCOMP Standardized Reg. Coffs.	F-ratio	p
CONCAT	-.111	-1.037	-.112	1.249	ns
ASSOCIAT	.098	.921	.100	.987	ns
SYNTH	.427	3.938	.427	18.107	.000
Constant	45.486				
R-Square	.264				
Residual	.892				

a. The underlined simple correlations are not significantly different from zero at the .05 level of significance. Key to the variable mnemonics: CONCAT= the concatenative dimension of discourse processing, ASSOCIAT= the associative dimension of discourse processing, SYNTH= the synthesizing dimension of discourse processing, RDGCOMP= grade four reading comprehension.

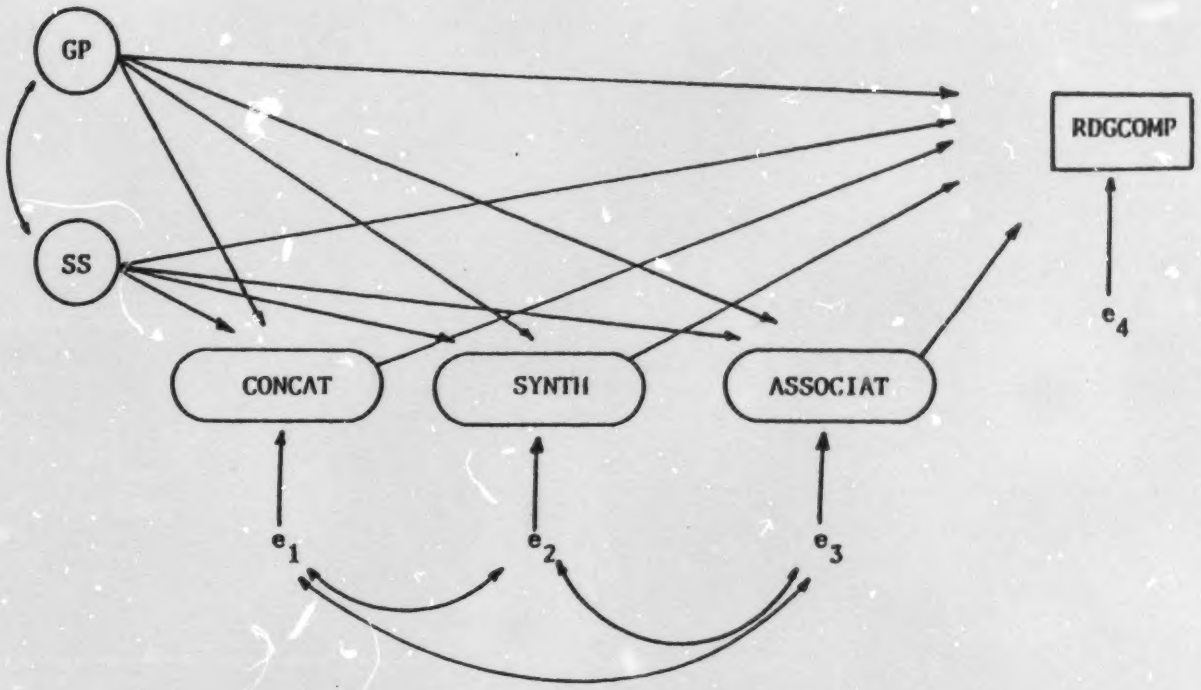

FIGURE 8 Integrated Model

Note: The model parameters (standardized betas and the residuals) are presented in Table 3. The correlations between the residuals of the discourse processing variables are as follows: $R_{CONCAT,SYNTH.GP,SS} = -.002$; $R_{SYNTH,ASSOCIAT.GP,SS} = -.033$; $R_{CONCAT,ASSOCIAT.GP,SS} = .007$.

TABLE 3

Integrated Reading Comprehension Model: Structural Coefficients, R-Square, and F-ratios[a]

	Dependent Variables									
	CONCAT					SYNTH				
Indep. Vars.	Simple Corr.	Regressn. Coeff.	St. Reg. Coeff.	F ratio	p	Simple Corr.	Regressn. Coeff.	St. Reg. Coeff.	F ratio	p
GP	-.032	-.032	-.031	.088	ns	.008	-.031	.030	.096	ns
SS	.013	-.012	.011	.011	ns	.350	.379	.352	12.654	.01
CONCAT										
SYNTH										
ASSOCIAT										
Constant		-.002					-.0003			
R-Square		.001					.123			
Residual		.999					.936			

TABLE 3 (cont'd.)

	Dependent Variables									
	ASSOCIAT					RDGCOMP				
Indep. Vars.	Simple Corr.	Regressn. Coeff.	St. Reg. Coeff.	F ratio	p	Simple Corr.	Regressn. Coeff.	St. Reg. Coeff.	F ratio	p
GP	.119	.127	.124	1.414	ns	-.136	-1.148	-.123	2.145	ns
SS	.070	.084	.078	.557	ns	.596	4.722	.481	28.976	.001
CONCAT						-.110	-1.101	-.121	2.100	ns
SYNTH						.457	2.651	.290	10.682	.005
ASSOCIAT						.119	.913	.100	1.422	ns
Constant		.0007					45.525			
R-Square		.020					.461			
Residual		.999					.734			

a. The underlined simple correlation coefficients are not significantly different from zero at the .05 level of significance. Key to the variable mnemonics: GP = Graphophonic cueing strategy; SS = Syntactic-Semantic cueing strategy; CONCAT = Concatenative information; SYNTH = Synthesized information; ASSOCIAT = Associated information; RDGCOMP = reading comprehension.

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